

## CLAIMS

1. A system for handling laser-communication multiplexing in chaotic secure communications, comprising
- 5 a system of transmitter containing a self-pulsating laser diode, wherein the self-pulsating laser diode is driven by an externally applied ac current containing the messages to be multiplexed;
- 10 a system of receiver containing a self-pulsating laser diode, wherein the self-pulsating laser diode is driven by the signals output from the transmitter and the output signals of the self-pulsating laser diode of the receiver can simplex couple to that of the transmitter, hence forming synchronized chaotic systems; and
- 15 a low-pass filter, whereto the difference between the output signals of the transmitter and the receiver is sent, and hence the chaotic time sequences of lower fractal dimension is transferred to the chaotic time sequences of higher fractal dimension and the periodicity of the multiplexed messages is emerged by adjusting an appropriate parameter of the low-pass filter, whereby the
- 20 decoding of the multiplexed message encoded by the chaotic laser light of the transmitter end can be achieved.
2. A method for handling laser-communication multiplexing in chaotic secure communications, which comprises the following procedures,
- 25 a. Applying a set of messages to be multiplexed and a corresponding set of ac currents to the laser diode of the transmitter;
- b. Driving the laser diode of the transmitter end by the said ac current set and adjusting the amplitude and frequency of the said ac current set to produce
- 30 chaotic laser signals;
- c. Driving the laser diode of the receiver end by the chaotic signals generated

from the transmitter end, and adjusting an appropriate coupling parameter to cause the output of the receiver simplex couples to that of the transmitter, and hence forming asymptotically synchronized chaotic systems.

- 5      d. Taking the difference between the input and output of the receiver end and sending the said difference to a low-pass filter; and
- e. Adjusting the parameter of the said low-pass filter, hence the chaotic time sequences of lower fractal dimension is transferred to the chaotic time
- 10      sequences of higher fractal dimension and the periodicity of the multiplexed messages is emerged, whereby the decoding of the multiplexed messages encoded by the chaotic laser light of the transmitter end can be achieved.
3. The system for handling laser-communication multiplexing in chaotic secure
- 15      communications as described in claim 1, wherein the parameter of the said low-pass filter is in the range 0.13-0.97.
4. The method for handling laser-communication multiplexing in chaotic secure communications as described in claim 2, wherein the parameter of the said
- 20      low-pass filter is in the range 0.13-0.97.